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ABSTRACT

The purpose of this paper is to relate psychology to teaching generally, and to relate behavior shaping to curriculum, specifically. Focusing on operant conditioning and learning, many studies are cited which illustrate some of the work being done toward effectively shaping or modifying student behavior whether in terms of subject matter or discipline. The paper reviews much of the research data presented in the professional journals since the middle 1960's documenting the efficacy of operant conditioning and learning in many areas of personal-social functioning. Consideration is also given in the paper to the increasing importance of instrumentation and technology in operant conditioning. A separate and select annotated bibliography includes key sources and summaries. (Author/SHM)

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OPERANT CONDITIONING AND LEARNING: EXAMPLES, SOURCES, TECHNOLOGY

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Abstract

We teachers need help with teaching. This paper focuses on operant conditioning and learning. Studies are cited which illustrate some of the work being done. Since the middle 1960's much data have been presented in the professional journals documenting the efficacy of operant conditioning and learning in many areas of personal-social functioning. Willian James was avidly interested in the teaching-learning process, so is B.F. Skinner, and so should we be. In this paper, many references are cited. A separate and select annotated bibliography includes key sources and summaries. Instrumentation and technology are becoming increasingly important in operant conditioning and learning, e.g., consider computers and biofeedback.

Psychologists often forget that teaching is an art rather than a science. Educators often forget that teaching is based on science and not just art. And as William James (1899) said, "Psychology is a science, and teaching is an art; and sciences never generate arts directly out of themselves. An intermediary inventive mind must make the application, by using its originality."

The purpose of this paper is to relate psychology to teaching, generally, and to relate behavior shaping to curriculum, specifically. It may be said that many educators are not knowledgeable of and/or familiar with the current research. It may also be said that many psychologists are not knowledgeable of and/or familiar with the problems of teaching and curriculum. This paper will focus on newer methods for effectively shaping or modifying student behavior whether in terms of concept or control, whether in terms of subject matter or discipline.

Newman wrote a book entitled Psychological Consultation in the Schools: A Catalyst for Learning. She recommends a program "... calling for the consultant to be continuously present, on the spot, relating as occasion arises to all members of the institution (principals, teachers, children, parents), attending staff meetings, and even, sometimes, filling in as a substitute." This type of program would be advantageous if it would increase communication and increase self awareness of members. But consultation would be entirely an ancillary service: it would not be involved in suggesting or making decisions about policy or curriculum. Rather it would adhere to present policies to avoid pressuring or threatening, so as to make psychological consultation possible to all. Although increased communication is definitely needed,

unless critical re-evaluation of present curriculum policies is a subsequent action leading to change, this program is seriously lacking. Goodman (1968) described Newman's consultant as a "...catalyst for the smoother operation of the school," not a catalyst for learning.

W. I. Gardner (1967) has also considered what the role of the psychologist should be. He suggests the psychologist should act as a social learning consultant and educator in both the residential center and in the community. In order to accomplish this, Gardner advocates acceptance of the behavior modification model and rejection of the medical model. He also recommends less time and involvement in psychotherapy since some research has indicated it is of dubious value and involves a costly expense of time.

McConnell (1968) advocated behavioral therapies--because they 'work." 'They work better than any form of therapy ever devised in the past. That is, the behavioral therapies cure people, get people out of mental hospitals sooner and in larger numbers than any other type of therapy anyone has ever devised. Furthermore, as a number of studies show, far fewer patients cured with behavioral techniques become sick again than do patients who are treated with other types of therapy." He went on to say that the prime reason the new behavioral therapies 'work" is that "...they're based on scientific experimentation rather than the humanistic speculation that underlies most other forms of therapy."

The behavioral revolution in America began with E. L. Thorndike and J. B. Watson. Impetus was given to the behavioral approach, when B. F. Skinner began to describe in precise terms the factors that control an organism's behavior. Skinner's initial work and scientific principles

came from his work with lower animals. Of utmost importance when trying to shape an animal's behavior, is to describe in very concrete, mechanical terms just what it is you want the animal to accomplish. McConnell (1968) stated that "One of the reasons that our education of human beings has been such a dull and ineffectual process is that we never got around to describing in...detail just what terminal behavior patterns an educated person should show."

Thus, having viewed Newman's, W. I. Gardner's, and McConnell's opinions of what the psychologists' role should be, one can conclude it should not consider diagnostics alone. Rather, the psychologist should consider diagnostics in conjunction with treatment. Treatment is the key to further academic or social development of the individual, without it there is little, if any, progress. The psychologist should emphasize therapeutic and remedial programs for teachers to follow in the classroom; they should be concerned with methods for making children with specific problems learn and adjust more effectively.

As Oliver (1965, p. 6) said, 'We may tentatively consider as a synonym for 'curriculum' the term 'the educational program.' The educational program consists of three basic elements: (1) the program of studies, (2) the program of activities, (3) the program of guidance."

Johnson (1968) made a careful distinction between remedial and other teaching. "The former is 'clinical' and is not tutoring in school subjects, nor going back to the developmental level at which the child is presently functioning, nor reducing goals or rate of presentation, nor synonymous with multiple sensory stimulation which impedes learning in some cases, nor teaching to the strengths or assets with resultant

overcompensation, nor talking about feelings and inadequacies, nor finally, a method approach....The child with a learning disability needs special teaching. While the classroom teacher uses intact responses, the special teacher works with the area of deficit." Curriculum, of course, encompasses all kinds of teaching.

Curriculum specialists, counselors, school psychologists, and teachers ought to consider operant learning techniques when devising programs for individual students and groups of students. Operant learning, derived from the descriptive behaviorism of Skinner is a technique that can be applied directly to the development of adaptive behavior. The teacher provides a favorable learning environment and at the same time arranges environmental factors to increase or decrease the frequency of certain responses. Behavior can be modified--shaped by applying principles of operant learning. One may gain control over relatively complex behavioral sequences, not just control over simple responses.

Programmed instruction can be very useful in curriculum planning because it follows principles of operant learning. The main principles of programmed instruction are: 1) reward as a motivation for learning, 2) learning in small steps, 3) active participation in learning, 4) learning with few or no errors, and 5) learning at one's own pace.

Research has shown that reward can be more effective than punishment in teaching because the latter may have emotion-inducing side effects which can block or inhibit learning. In the case of reward, we find it to be more effective if it immediately follows the response and if it is selective (given only when the correct or desired response is emitted).

The most important feature of reward is that it has its greatest effectiveness when the reward for right responses is given at each small

step in the learning process. Learning is inefficient if each successive step is not mastered in turn--the material becomes confusing and aversive. In programmed instruction, a subject is broken down into many brief items. Each helps lead the student from the simple toward the complex, requiring him to lean more and more on what he learned as he goes along.

Active participation is more effective than passive reception. The student will learn faster and remember longer if he is personally making the responses involved in the step-by-step process, and is personally receiving reinforcement for right responses.

Learning with few or no errors is conducive to further learning. It has been shown that we learn better if we make few errors. Making mistakes is time consuming and frustrating to the student in the learning situation. When a student makes many mistakes it means that one step does not lead logically to the next step or the steps in the process may be too large. The learning situation may become punishing and aversive to the student who is making errors, which often results in a decline of natural motivation to learn.

Learning is best when a student proceeds at his own pace. In the classroom many students fall behind because they misunderstand a point. In programmed lerrning, the lesson proceeds only if the student has completed a step and understands it. This is good "theory." Levine (1963) aptly debated (for and against) programmed reading instruction. This is good "reality."

The principles of operant conditioning and behavior modification techniques have been applied to the mentally retarded. "The results of studies of the application of behavior modification techniques to the

mentally retarded have clearly established this method as a primary therapeutic tool" (J. M. Gardner, 1968). This is especially true, for the severely and profoundly retarded for whom traditional methods have been of little value. And of all curriculum "problems," severely and profoundly retarded students with their multiple sensory-motor handicaps are among the most difficult to reach.

Blackman and Capobianco (1965) reported that although no academic superiority was evidenced by their teaching machine, i.e.,programmed instruction groups (of retarded adolescents), greater improvement in deportment was shown by the latter groups as compared with the no-teaching machine groups studied. The latter investigator offers as a rationale for the significant improvement in the deportment of the experimental groups the possibility that "the teaching machine and its accompanying program.... may have operated to improve the classroom behaviors of the subjects....by reducing frustration and maximizing attention."

Mogel and Schiff (1967) extinguished a head-bumping symptom of eight years duration in two minutes by requiring the patient to perform the habit in the presence of the therapist, whose approval was highly important to the patient. Analogously, one could work with the student and teacher.

Girardeau and Spradlin (1964) showed how a program based on positive reinforcement was established to manage and train moderately and severely retarded girls in a residential center. Tokens were established as generalized reinforcers by making them redeemable in food, soft drinks, jewelry, clothing and novelties. These tokens were delivered to the children whenever they were engaged in constructive socially acceptable

activities. Results indicated socially acceptable behavior appeared to increase in frequency.

Also, Fuller (1949) trained a bedridden 18-year-old "vegetative idiot" to move his arm to earn a food reward. "Psychotic and mentally retarded children have been successfully treated for poverty in generalized imitation tendencies (Metz, 1965), self-help behavior (Bensberg, Colwell & Cassel, 1965) and speech deficiency (Commons, Paul & Farno, 1966; Cook & Adams, 1966; Kerr, Meyerson & Michael, 1965, etc.)" (Gelfand & Hartmann, 1968).

Metz (1966), of the University of California and Camarillo State Hospital, illustrated the use of operant conditioning methods in the study and treatment of hospitalized, emotionally disturbed children. He first showed how the children were conditioned in groups to become more independent and engage in more socially acceptable behavior in connection with preparing to eat a meal. The specific procedure followed was: the children were conditioned to take poker chips and place them in a box before they could eat lunch, then they had to run their hand under water before they could get a chip, gradually the requirements were increased--before a poker chip could be obtained the child had to wash his hands with soap, dry his hands, and deposit the paper towel in the wastebasket. Finally, the chips and token box were eliminated so that the children could carry out the routine independently with a minimum of supervision. The overall effect of such training was "...to create a sense of order and a feeling of self-control in these disorganized children, provide them with socially and personally useful skills, create a more emotionally satisfactory atmosphere during each of these activities and free nursing personnel for more creative work with the children" (Metz, 1966).

Metz also spoke of using discriminative stimuli with autistic and schizophrenic children in an attempt to learn about their language competence and about their ability to process information. These children are extremely difficult to work with especially in a school setting. However, operant conditioning principles have been applied successfully. Simultaneous use of acceleration and deceleration modification techniques has been shown to be a powerful approach to the treatment of resistant and maladaptive behavior patterns, often exhibited by these children (Lovaas, Freitag, Gold & Kassorla, 1965). Lovaas, Schaeffer and Simmons (1965) showed an increase in social behavior in two 5-year-old identical twins diagnosed as childhood schizophrenics with autistic features subsequent to shock-escape training. Wolf, Risley, and Mees (1964) worked with a 3-year-old severely autistic boy to produce considerable positive behavior change through a combination of positive reinforcement (food) and a procedure described as "mild punishment" and extinction which involved isolating the child in his bedroom contingent upon his having had a temper tantrum. Extinction of bizarre and tantrum behaviors has been combined with social reinforcement for appropriate responses in a special classroom situation (Zimmerman & Zimmerman, 1962) while Marshall (1966) successfully toilet trained an 8-year-old autistic child using food reinforcement and mild punishment. Davison (1964) extinguished fear and aggressive responses, while he increased responsiveness to adult requests in a 9-year-old autistic girl through contingent application of candy, attention and opportunities to look into a mirror, and withdrawal of social reinforcement for undesirable behavior. Lovaas' (1966) exploratory studies on a 9-year-old echolalic girl indicated that use of food as reinforcement and withdrawal of food as punishment suppressed echolalic speech and established

more appropriate language behavior.

Simultaneous use of acceleration and deceleration techniques also seem to facilitate treatment of non-psychotic children's aggression (Gittelman, 1965; Sloane, Johnston & Bijou, 1968), school phobia (Lazarus, Davison & Polefka, 1965), encopresis in the school (Pedrini & Pedrini, 1971), operant crying (Hart, Allen, Buell, Harris & Wolf, 1964), and anorexia nervosa (Hallsten, 1965).

Metz (1966) discussed several possible misconceptions of operant conditioning. He emphasized that operant conditioning is more than the application of rewards and punishments to control behavior; discriminative stimul. as well as reinforcers must be included. He sees the behavior therapy process as "...an interaction between patient and therapist which leads step by step to an ever increasing ability of each to influence the other" (Metz, 1966). Rewards and punishments are not new concepts. They have been applied and are part of our primitive heritage, are part of our Judeo-Christian heritage, etc. But the scheduling, the modifications of the "how" it is done is much newer, more recent. Operant conditioning and learning has been applied in many, many areas of personal-social functioning.

There are many problems with regard to research. J. M. Gardner (1969) in reviewing some of the research in behavior modification and retardation reveals that there have been errors in design and methodology. He says that it is necessary to include: "(1) the exact specification of all relevant independent variables, (2) proper sampling techniques, (3) use of adequate control procedures, (4) proper assessment of the dependent variable, and (5) evaluation of long term gains."

Gelfand and Hartmann (1968), in their review article, also point

out the need for behavior therapy studies to meet the assessment standards of traditional research methodology. Unfortunately, there are few such studies regarding behavior therapy with children. However, they also indicate that "...in contrast to the play-therapy case-study literature, there are a small but growing number of carefully designed behavior-therapy case studies which meet most, if not all, of the suggested evaluation criteria and which convincingly demonstrate the power and efficiency of behavioristic treatment approaches (Allen et al., 1964; Doubros & Daniels, 1966; Harris et al., 1964; Whaler et al., 1965)." Thus, one is able to argue the merits of behavior therapy techniques on a theoretical basis; and as the "single organism, within subject" design (Gelfand & Hartmann, 1968) is applied, there will be more evidence of the method's effectiveness.

Other excellent review articles are by Cahoon (1968), Katkin and Murray (1968), O'Leary and Drabman (1971), and O'Leary, Poulos and Devine (1972). The O'Leary articles are especially applicable to classroom teaching.

One problem educators face today with research is the knowledge and information explosion. We need better standard journal and book control, e.g., extensive computer storage and retrieval.

Currently of great help in cumulating educational data are ERIC: RIE (1966 to the present) and ERIC: CIJE (1969 to the present). Psychological Abstracts and Education Index may be consulted directly, and need to be consulted for periods preceding ERIC.

NSSE (National Society for the Study of Education) has published yearbooks in the area of educational data and information since the

turn of the century. AERA (The American Educational Research Association) attempts to stimulate and focus upon pertinent studies. Of help are such AERA tomes as the Encyclopedia of Educational Research and the Handbook of Research on Teaching.

We need a research orientation in curriculum and education. Our teaching-learning should be grounded in experimental findings.

Skinner, in an interview with Evans (1968), has made specific suggestions for the improvement of our curriculum. He says that teaching machines are only one aspect of the whole technology of teaching, "... to effect a change you've got to arrange much better schedules of reinforcement than the teacher can possibly arrange where the student will be appropriately reinforced to shape his behavior progressively toward the goals of education." Skinner has written much (e.g., 1968, 1972) which is germane to the teaching-learning process.

And finally, as Martin (1972) said in discussing school critics of the 1950's and of the 1960's, teachers "...need people who are genuinely interested in helping them to resolve their everyday difficulties and frustrations and to develop new innovative programs." The areas of psychology and behavior shaping can be helpful and are strongly recommended.

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Behavioral Information and Technology. Baltimore, Maryland. This company has various bibliographies available for those who do not wish to peruse Psychological Abstracts for themselves. For example, in the general area of operant conditioning and learning, they include a bibliography of books, of educational settings, of behavioral objectives, and of filmography.

CAI/CMI Information Exchanges: Computer-Assisted/Computer-Managed Instruction. Newburyport, Massachusetts: Entelek. This reference contains abstracts of CAI/CMI research reports, specifications of CAI programs, and descriptions of CAI facilities. This book is kept up to date annually. Persons participating in the exchange receive monthly newsletters, working papers, conference reports, and microfiche copies of all research abstracts.

Cahoon, D.D. Symptom substitution and the behavior therapies. Psychological Bulletin, 1968, 69, 149-156. A point of disagreement separating "behavior" therapists and "dynamically oriented" therapists involves the symptom substitution hypothesis. That is, will removal of "symptoms" without attention to the "underlying causes" of the symptoms lead to the formation of new symptoms? Examination of the literature reveals that rarely have these terms been used in ways that do not involve inferences and constructs peculiar to specific theoretical systems. The present paper attempts to reformulate the symptom substitution hypothesis in a way which is empirically investigable. From this base, some procedures germane to the behavior therapies are examined with respect to their possible

relevance to the development or nondevelopment of new symptoms following treatment. The issue of whether or not certain kinds of therapies are more likely to lead to the formulation of new symptoms than are other therapies is an empirical matter deserving experimental investigation.--Journal abstract.

ERIC (Educational Resources Information Center). Clearinghouse on Educational Media and Technology. Stanford, Calif.: Eric at Stanford, Institute for Communication Research, Stanford University. This Clearinghouse continually collects and disseminates information on programmed instruction, computer-assisted instruction, television teaching, instructional films, audiovisual techniques, etc.

Gelfand, Donna M., & Hartmann, D. P. Behavior therapy with children: A review and evaluation of research methodology. Psychological Bulletin, 1968, 69, 204-215. In this review of the literature on behavior therapy with children, papers are classified in terms of the therapist's goals in treatment including: (a) deceleration of maladaptive behavior, (b) acceleration of prosocial behavior, and (c) combined promotion of adaptive behavior and control of problematic behavior. Although a number of the studies reviewed convincingly demonstrate the efficacy of behavioristic treatment approaches, the majority of papers were inadequately controlled and incompletely recorded case studies. It is suggested that when individual Ss are used for therapy-evaluation studies, E should provide: (a) adequate base-line measures of the target behavior, (b) systematic variation of reinforcement contingencies or other procedures demonstrating control of S's behavior, (c) evidence

that behavior observations are unbiased, and (d) rigorous follow-up evaluations--Journal abstract.

Hendershot, C.H. (Editor and Compiler) Programmed Learning: A Bibliography of Programmed and Presentation Devices. Bay City, Michigan: C.H.H., 4114 Ridgewood Drive. This reference is kept up to date with new additions and supplements.

Johnston, J.M. Punishment of human behavior. American Psychologist, 1972, 27, 1033-1054. This article organizes and assesses research in this area by thoroughly analyzing available literature, particularly with respect to data that are already available from the experimental laboratory. The studies selected for examination have in common a number of characteristics that qualified them for consideration. They all resulted from attempts to apply punishment procedures, following the definition described below, to the ongoing operant behavior of human individuals in nonlaboratory or field settings, and the results of these efforts are described in some quantified manner which critically examines the worth of the effects of the procedures in terms of justifying conclusions based on the data. The material is analyzed in terms of those behaviors of the experimenter or therapist that are related to the effects of such procedures, and in terms of the variables which the subject's behavior brings to the applied setting. Suggestions are offered for the increased effectiveness of punishment procedures, as well as for future research in the area.--Author quotation.

Katkin, E.S., & Murray, E.N. Instrumental conditioning of autonomically mediated behavior: Theoretical and methodological issues.

Psychological Bulletin, 1968, 70, 52-68. Research on instrumental conditioning of electrodermal responses, peripheral vascular activity, and heart rate is reviewed. Major problems with research in the area are described, emphasizing such methodological shortcomings as inappropriate controls and systematic biasing effects, and focusing on alternative explanations of positive findings. A distinction is drawn between "conditioning" and "controlling" autonomic activity.--Journal abstract.

Kazdin, A.E. The token economy: An annotated bibliography. JSAS Catalog of Selected Documents in Psychology, 2, 1972, MS. NO. JSAS-86 (57 pages). The use of reinforcement for the purpose of treatment, education, and rehabilitation has proliferated quite recently. This has been facilitated by the use of generalized conditioned reinforcers (tokens) that overcome several limitations associated with reliance on a single primary reinforcer. As a result, token economies have been developed for several populations, including psychiatric patients, children and adolescents in educational settings, the mentally retarded, delinquents, autistic children, and others. Investigations of the efficacy of token economies with these groups are annotated. In addition, laboratory studies of token reinforcement with human Ss, reviews of token economies, and technical articles that suggest procedures useful to the implementation of token economies are annotated. A wide range of procedures, experimental designs, methodological issues, and findings are presented in the bibliography.--Journal abstract.

O'Leary, K.D., & Drabman, R. Token reinforcement programs in the classroom: A review. Psychological Bulletin, 1971, 75, 379-398.

Although token reinforcement programs began less than a decade ago, their use in classrooms has grown rapidly in popularity as a therapeutic procedure. These programs have demonstrated effectiveness in changing the academic and social behavior of very diverse child populations. However, the use of token and backup reinforcement is but one procedure within a complex constellation of factors in the overall token reinforcement program. A number of such factors are examined which may critically influence the success of a token program including the teacher, the child, the parent, and the system of reinforcement. Methodological considerations such as type of experimental design, observer bias, and replicability are discussed. There are several methodological problems which should be addressed in token reinforcement studies, but because of the powerful nature of a token reinforcement program, the generally positive results reported thus far will probably withstand stringent methodological tests. On the other hand, the long-term effectiveness of such programs has only begin to receive attention, and a number of suggestions are made to achieve such effectiveness.--Journal abstract.

O'Leary, K.D., Poulos, Rita W., & Devine, V.T. Tangible reinforcers: Bonuses or bribes? Journal of Consulting and Clinical Psychology, 1972, 38, 1-8. Objections to the use of tangible reinforcers, such as prizes, candy, cigarettes, and money, are discussed. These objections range from concerns about bribery to concerns about adverse behavioral effects. While the use of tangible reinforcers has been extensively shown to change certain behaviors, their misuse is all too frequent, and attention to the objections to

tangible reinforcers should alert one to these misuses. Treatment programs using tangible reinforcers are recommended as powerful modifiers of behavior to be implemented only after less powerful means of modification have been tried.--Journal abstract.

Shack, J.R., & Barnett, L.W. An Annotated and Indexed Bibliography of Behavior Management with Children. Chicago: Guidance Center, Loyola University, 1973. The new annotated and cross-indexed bibliography includes nearly all materials published since 1920 through 1972 relating to behavioral techniques applied to children. The work includes 462 references in 104 pages plus a 600 item primary and secondary author index and a 4 page 31 category cross index listing. A flexible fastener binds the bibliography to allow for easy incorporation of additional materials. In the future there will be yearly supplements to the basic bibliography.--Author quotation.

Stoelting Company. Physiological, Psychological, Stereotaxic Instruments. Chicago, Illinois. This company and its catalogs illustrate many different kinds of instrumentation helpful in operant conditioning. For example consider the "automatic manipulanda cage or box," as Skinner says, or the "Skinner box," as we say. Also, note the bio-feedback systems which are being used more and more in operant conditioning (getting into the "black box," so to speak).

White, O.R. (Compiler and Editor) A Glossary of Behavioral Terminology. Champaign, Ill.: Research Press, 1971. The development of a sophisticated language of behavior has produced the need for a

glossary which gives specific definitions of behavioral terms. This book accurately and specifically defines behavioral words and phrases. It aids in upgrading communication. Whenever appropriate, the Glossary gives the rationale of the term as well as its meaning when used in different contexts.

Yearbook(s) of the National Society for the Study of Education. Behavior Modification in Education. Chicago: U. of Chicago Press, 1973. The Seventy-Second Yearbook. This redoubtable Yearbook series, initiated at the beginning of the twentieth century, goes on and on giving us many timely articles on always timely areas.